

**United States  
Environmental Protection Agency**

**Office of Transportation and Air Quality  
National Vehicle and Fuel Emissions Laboratory  
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Ann Arbor, MI 48105**

**Particulate Mass Filter Setup and Transport Procedure**

This procedure is written for the Environmental Protection Agency, National Vehicle and Fuel Emissions Laboratory (NVFEL) internal use. The use of specific brand names by NVFEL in this procedure is for reference only and is not an endorsement of those products. This document may be used for guidance by other laboratories.

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See Attachment A

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## **1. Purpose and Overview**

The purposes of this procedure are:

To describe the steps required to ensure the traceability of specific Particulate Mass (PM) filters to the specific emission test, phase and sampling unit for which they were used.

To describe the proper transport of new filters from the filter weighing room to the test site and the return of the loaded filters to the filter weighing room.

## **2. Applicability**

This procedure applies to samples collected with the Horiba® Heated Particulate Filter Unit Model HF47. Filter weighing and data collection are described in the Filter Handling and Weighing Procedure (NVFEL 714).

## **3. References**

- 3.1 Horiba “Particulate Sampler Unit Operations Manual”
- 3.2 “Code of Federal Regulations,” Title 40, Part 86, Subpart N, Sections 86.1312-2007, 86.1337-2007
- 3.3 “Code of Federal Regulations,” Title 40, Part 1065, Sections 1065.190, 1065.390, 1065.590
- 3.4 Environmental Protection Agency (EPA) current safety policies
- 3.5 The Filter Handling and Weighing Procedure NVFEL 714

## **4. Required Equipment**

- 4.1 47mm PTFE membrane filters
- 4.2 Petri dishes
- 4.3 47mm filter holders and filter cassettes

- 4.4 Filter cassette separation tool
- 4.5 Horiba Particulate Sampler Unit. (HF47)
- 4.6 Filter weighing environment for weighing and stabilization. The NVFEL uses an “ISO Class 6” clean room that is referred to in this document as the “filter weighing room”.

## **5. Precautions**

- 5.1 Components inside the HF47 enclosure are HOT. (47°C / 117°F) Be very careful so as to avoid burns.
- 5.2 Do not touch filter material or filter support screens with fingers.
- 5.3 Use care while handling the filter cassettes to prevent filter material from being damaged.

## **6. Visual Inspection**

- 6.1 Whenever the filters, or loaded filter cassettes are handled, ensure that the filter material does not appear damaged. If any abnormality is noted prior to the test, do not use the filter. If any abnormality is observed after sample collection, note the abnormality on Form 714-01, “PM Filter Pretest Weighing and Sample Assignment”, and in the comment section of the test report.
- 6.2 All other required visual inspections are described in subsequent sections of this procedure.

## **7. Preparation**

- 7.1 Locate a group of pre-weighed filters, loaded in cassettes and in Petri dishes, in the filter room. Ensure that a particulate filter data form, Form 714-01, accompanies the filters.
- 7.2 Filter numbers are not visible once the filter is loaded into the cassette. Refer to the five-digit number on the Petri dish, and ensure that these numbers match those listed on the form. These five digits correspond to the last five digits of the serial number stamped on the filter.

## 7.3 Verify that:

- Pretest filter weights appear on form 714-01.
- There are no quality flags on the form. If there are any flags verify that the pretest weighing results are valid before using the filters.
- The serial number of the balance used for pretest weighing appears on the form.

## 7.4 In each sample system, there are three HF47s labeled “A”, “B”, “C”. Each HF47 has four filter positions labeled “1”, “2”, “3”, and “4”. Label the Petri dishes with the letter designation for HF47 unit, and numbered position in the unit, that each filter will be installed in.

The numbers on the labels refer to distinct sample phases and/or tests. The letters refer to independent sample filters collected in parallel during each phase.

Once all the dishes are labeled, enter the HF47 letters, and position numbers, in the “PSU” and “Phase or Mode” columns corresponding to the appropriate filter numbers, on Form 714-01.

## 7.5 Load the Petri dishes in a carrier suitable for transporting them to the test cell. Write in the date and time the filters are leaving the weighing room on Form 714-01.

**8. Procedure****100 Transport from “Filter Weighing Room” to Site**

101 Transport Form 714-01 and the filters in the closed Petri dishes to the test cell. Ensure that the dishes remain closed and horizontal during transport.

102 Place the Petri dishes with cassettes in the proper order for loading. Remove filter holders from the HF-47 units and place in front or behind the corresponding Petri dishes.

103 Install the filter cassettes into the filter holders filter side up, matching the position label on the Petri dish with the position label on the filter holder.

If the positions in which the filters are used must be changed from those indicated on Form 714-01, draw a single line through the original data on the form and write in the change. Initial and date any alterations.

- 104 Install the filter holders in the HF-47 units in the appropriately labeled positions according to the A1, A2, A3, A4, B1, B2, B3, B4, C1, C2, C3, C4 scheme.
- 105 Once all holders are installed and the HF-47 oven door is closed, allow 10 – 15 minutes for the HF47 and filter holder temperatures to stabilize before starting the test.
- 107 Record the test site identification; date, and test start time on Form 714-01. Enter test number(s) if they are not already recorded on the form.

**200 Transport from site to “Filter Weighing Room”.**

- 201 After all test phases are run, enter the test end time on Form 714-01. Remove the filter holder from the HF-47 and place in order, adjacent to the corresponding Petri dishes.
- 202 Remove the cassettes from the filter holders and place in the correct Petri dishes. Verify that the position identifier on the filter holder matches the identifier on the Petri dish. Cover the dishes. Enter the “Filters Removed From Holders” time on Form 714-01.
- 203 Return the closed Petri dishes to the filter weighing room as soon as possible, but not later than one hour after the cassettes are removed from the filter holders.
- 204 Once the filters are in the filter weighing room, record the return time on Form 714-01. Ensure that the test number is recorded for each filter on Form 714-01. This is critical for proper electronic data processing.

Leave the covers on the Petri dish and place the dishes on a shelf marked sign “Post test filters. Need to be weighed.” Leave Form 714-01 with the filters. Information that was hand written on Form 714-01 will later be entered in the filter weight processor as part of the final weighing process. Form 714-01 must be retrieved after the filters are weighed, and filed with the test packet. The weighing room technician will further prepare the cassettes and Petri dishes for conditioning (NVFEL 714).

**9. Test Data Input**

- 9.1 Date and time filters left room
- 9.2 Test site identification
- 9.3 Test number(s), start date and time
- 9.4 Filters removed from holders time
- 9.5 Conditioning start date and time

**10. Data Analysis**

- 10.1 Review Form 714-01 for correctness and completeness.

**11. Data Record and Output**

- 11.1 File the completed Form 714-01 in the test packet.

**12. Acceptance Criteria**

- 12.1 Should the sample on a filter contact the Petri dish or any other surface, the affected test is void and must be rerun.
- 12.2 Filter cassettes must be firmly closed.
- 12.3 Petri dishes must be labeled with the filter ID and appropriate filter holder location in the HF-47 unit.
- 12.4 No electronic validation flags are to appear on Form 714-01.
- 12.5 Pretest weights and balance serial number must appear on Form 714-01
- 12.6 After emissions testing, loaded filters must be returned to filter weighing room within 1 hour of being removed from the filter holders.
- 12.7 All data identified in Section 9 must appear on Form 714-01.

### 13. Quality Provisions

- 13.1 Filters in cassettes or holders are handled such that the loaded side of the filter remains in a vertically up orientation.
- 13.2 During filter conditioning, Petri dish covers are left slight ajar to ensure proper air circulation. Petri dish covers are placed so that they still remain immediately above the filter to prevent dust or other foreign material from settling on the filter.
- 13.3 Particulate filter data processing software record timestamps for form creation, reference filter usage, filter weighing begin and end events, and test begin and end. These timestamps are used to retrieve data logged in Oracle Data Base tables, to report Quality Control exceptions, and to verify and report that activities occurred within the allowable time limits.
- 13.4 Ambient Condition monitoring software and hardware log ambient conditions to an Oracle database every 15 minutes. Out of tolerance conditions, with respect to regulatory and laboratory requirements are logged as they occur. Out of tolerance conditions monitored by filter processing software will be automatically reported on form 714-01.
- 13.5 The similar configurations and use of test site PSUs allows for commonality of filter handling throughout the NVFEL. This consistency across test sites, in training, and in this procedure minimizes the chance of mishandling or improperly positioning filters.

## Appendix A

### Revision History

[illegible]

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